

Improvement of Soil Physical and Chemical Properties with Municipal Solid Waste Compost Application in soya bean (*Glycine max*), Mung (*Vignaradiate*), Lentil (*Lens culinaris*) Seeds.

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Abstract: The present works were carried out to determine the impact of different municipal solid waste compost (mswc) soil extracts (Tap water, 5%, 10%, 15%, 20%, 25%, 30% and distilled water (control) obtained from mswc (degraded soil) and different mixing ratio of mswc and distilled water on the percentage of relative seed germination (RSG%), vigor index, root length, shoot length of soya bean (*Glycine max*). Mung (*Vigna radiate*), Lentil (*Lens culinaris*) were studying by bioassay method. Seeds were sown in plastic pots as randomized completely block design with different concentration of soil extract Tap water, 5%, 10%, 15%, 20%, 25%, 30% and distilled water (control). The results after 24, 48, 72, 96 hours showed that seedling of Mung, Lentil and soya bean grown on 15%, 20%, 25%, 30% extracts. The best value of vigor index and RSG%. From the study it is concluded that the increased seedling growth in soil extract is best in high concentration (30%) of degrade soil extract. It is summarized that the increase soil nutrient can be useful in seedling production of Dicotylidion seeds.

Key Word-Degraded soil, relative seed germination, vigor index, plant nutrient, organic matter.

INTRODUCTION

Recent studies on the effects of compost on Physico-chemical properties of soil showed that [2] addition of compost to soil increase organic matter and nutrient (micro and macronutrients) of soil, improve physical and chemical properties of soil. The compost is good source of Nitrogen (N). Compost also supplies partial requirements of plant to Phosphorus (P), Potassium (K) and micronutrients.[3]Maturity of compost measured using physical, chemical and biological techniques.[4] The main cause of toxicity in plants are increased solubility of heavy metals, toxic substances such as ammonium, ethylene oxide and organic acid.[5].The growth and yield is very high attempt to determine the appropriate amount of compost is used for soya bean (*Glycine max*). Mung bean (*Vigna radiate*) and Lentil (*Lens culinaris*) [6]. The technique of evaluating nutrient of degraded soil extract on germination and early growth of soya bean (*Glycine max*), Mung bean (*Vigna radiate*), and Lentil (*Lens culinaris*) seeds were performed in the recent experiment. The quantitative and qualitative productions of seedling in nurseries are highly affected by various factors. For improving the nutrition contents, soil

texture, plant tissue and higher yield production chemical fertilizers are useful. [7]. Organic matter is a better alternative due to the environmental limitations and decrease of soil fertility in long term and is also economically beneficial.[8]. The affect of organic matter on increase soil fertility is also determined by many studies.[9] By virtue of this mswc increase the affect on seed germination and seedling growth and the initial phase in the life cycle of plants is increased[10]

MATERIALS AND METHODS

Study area:

The experimental field “KUNDRAPARA” situated in district Durg in CHHATTISGARH STATE. Durg city of country India lies on the geographical coordinates of 21° 11'0"N, 81017'0"E. This site is dumping fill site the Area of KUNDRAPARA site is 49 squares km its 50 years old. Daily, 70 tones solid waste materials are dump in this site. The dumped material consists of 60 tones of household waste and 10 tones of municipal solid waste are deposited here

Research method:

After sampling, the sample was stepwise prepared for analysis. Traces of non-biodegradable materials as pieces of plastic and glass have been separated by prickling. The soil sample were dried at 40°C up to one hour disintegrated and sieved to \leq two millimetres. The dried samples were grounded using mortar and pestle to particle size of \leq 0.5 millimetres and then stored in air tight plastic bags. All tool materials which have been used plastic or agate. The characteristics of municipal solid waste compost are shown in table [1]. In this experiment twenty five seeds were placed per Petri dish, 100 millimetres in width, on filter paper moistened with tap water, 5%, 10%, 15%, 20%, 25%, 30% solution of municipal solid waste compost extract and distilled water as the control. In each Petri dish were added 10 milliliters of soil extract. For control treatment distilled water was added to Petri dish during the treatments Petri dishes were placed in laboratory at 25°C. Counting were germinated seed every day, after 24, 48, 72, 96 hours of wetting. Each treatment was repeated five times. Data analyzes was done using a completely randomized design. Percentage of relative seed germination, vigor index, and radical and plumule length was determined by counting the number of germinated seed and expressed as percentage.

Were calculated by using formula 1 and 2 as follows:

$$[1] \quad \text{Percentage of relative seed germination} = \frac{\text{Number of seed germinated in soil extract}}{\text{Number of seed germinated in control}} \times 100$$

$$[2] \quad \text{Vigor index} = \text{Germination \%} \times \text{Seedling total length}$$

RESULTS AND DISCUSSION

Physico-chemical analysis

The value for the Physico-chemical characteristics of municipal solid waste soil shown in Table .1 the chemical characteristics determined are N, P, K and trace element as Ca, Mg, Zn, Fe, Cu, Mn, Physical properties pH, moisture%, Electrical conductivity (EC) and salinity obtained values are compared with standard values of compost. We can use this soil as organic fertilizer.

Percentage of relative seed germination

The result of the percentage of relative seed germination (RSG %) is shown in Table 2. At 24 hours, higher value of RSG% seen in Mung seed for 10%, 15%, 20%, 25%, 30% but for 5% lentil seed RSG% value is higher at 48 hours, higher value of RSG% seen in 20%, 25%, 30% for Mung seed, but for 5%, 15%, lentil seed shows higher value. At 72 hours, much higher value seen in soya bean for every percentage shown in Fig. (1). At 96 hours, value of RSG% is very higher in the case of soya bean seed higher RSG% value indicating that those species having the highest relative growth rates in the fertile environment were almost severely affected by a reduction in nutrient concentration. High potential relative growth rate is seen when growing in optimal growth conditions and the degree of reduction of relative growth rate in

Vigor index

The value of vigor index is shown in Table 3. At 24 hours the higher value of vigor index is found in Mung seed for tap water, distilled water, 5%, 10%, 15%, 20%, 25%, 30% extracts at 48 hours the higher value of vigor index, seen in tap water, distilled water, 5%, 10%, 15%, 20%, for Mung seed whereas for lentil seed is 25%, 30% shows higher value At 72 hours, much higher value seen in Mung seed for every percentage shown in Fig. (2). at 96 hours, value of vigor index is very higher in the Mung seeds for every percentage compare with soya bean shown in Fig. (2). According to high value of vigor index is show municipal solid waste compost more effective for Mung seed.

Root length

The result of root length is shown in Table 4. At 24 hours, the higher value of root length in Mung seed for every percentage of extract compared to lentil seed and soya bean shown in Fig. (3). At 48 hours, the higher value found in Mung seed in order to tap water, distilled water, 5%, 10%, 15%, 20%,

30% extracts. At 72 hours, the higher value of root length in 20%.

At 96 hours, the higher root length of lentil seed in 30% concentration of extract shown in Fig (3).The higher value of root length has been seen in the 25% and 30% at 96 hours for soya bean seed shown in Fig (3).

Shoot length

The result of shoot length is shown in Table 5 Shoot length growth in lentil seed is shown in the 48, 72, 96 hours. In the case of Mung seed shoot length growth only shown in 72 and 96 hours. But in soya bean seed not any significant effect has been seen at any time. In both seed (lentil and Mung), higher value of shoot length growth is seen in 96 hours. Shown in Fig. (4)

CONCLUSION

This experimental studies show the impact of the municipal solid waste compost and the different growth rate of Dicotylodon seeds {soya bean, Mung , Lentil (*Glycine max*, *Vigna radiate*, *Lens culinaris*)} In general, from the present study it can be summarized that germination, RSG%, vigor index, root growth and shoot length of lentil, Mung, soya bean seed were enhanced by using municipal solid waste compost. This shows that organic matter can be useful for growth medium component, the plant growing requirement; municipal solid waste compost has been used appropriately to show the physical and chemical properties of soils.

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Table:-1 Physico-chemical parameters of municipal solid waste soil (Compost).

S.No.	Parameters	Municipal solid waste soil [Kundrapara site]
1	<u>Physical properties</u> ↓	
	Color	Black
	Temperature (°C)	33.6
	Moisture (%)	1.89
	pH	7.15
	EC (m mhos / cm)	0.427
	Salinity (m mhos /cm)	0.616
2.	<u>Macronutrients in k.g. /hec.</u> ↓	
	Nitrogen	167.25
	Phosphorus	383.98
	Potassium	834.7
3.	<u>Micronutrients in ppm</u> ↓	
.	Ca	253.3
.	Mg	123.33
.	Zn	4.40
.	Fe	21.29
.	Cu	10.55
.	Mn	23.79

Table: 2 Effect of concentration of compost extract on percentage of Relative seed germination (RSG %).

Extract concentration	RSG % of Mung seed				RSG % of Lentil seed				RSG % of Soya bean			
Time(hours)→	24	48	72	96	24	48	72	96	24	48	72	96
Tap water (without soil)	125	125	111.1	111.1	200	133.3	114.2	108.6	0	0	150	150
Distilled water (without soil)	100	100	100	100	100	100	100	100	0	0	100	100
concentration% of compost ↓ extract												
5	125	125	111.1	111.1	200	133.3	109.5	108.6	0	0	250	250
10	125	125	111.1	111.1	66.66	133.3	119	108.6	0	0	300	300
15	125	125	111.1	111.1	0	100	104.7	108.6	0	0	400	400
20	112.5	125	111.1	111.1	0	100	119	108.6	0	0	450	450
25	125	125	111.1	111.1	33.3	133.3	119	108.6	0	0	300	300
30	125	125	111.1	111.1	0	100	119	108.6	0	0	300	350

Table: 3 Effect of concentration of compost extract on Vigor index.

Extract concentration	Vigor index of Mung seed				Vigor index of Lentil seed				Vigor index of Soya bean			
Time(hours)→	24	48	72	96	24	48	72	96	24	48	72	96
Tap water (without soil)	94	227	700	963	21	91.52	143.4	214	0	0	13.98	22.5
Distilled water (without soil)	31.2	137.6	312.3	325.8	3.0	49.2	100.8	156.4	0	0	4.0	8.0
concentration% of compost ↓ extract												
5	85	216	687	948	24	115.2	163.7	200	0	12	41	60
10	121	288	885	1132	12	176	300	340	0	35	67.2	87
15	103	205	687	839	0	156	290	400	0	49	97.6	136
20	106.6	307.7	988	1359	0	162	330	420	0	56	120.6	175.5
25	93	244	885	1096	0	256	380	500	0	50	90	207
30	30	77	899	899	0	432	473	567	0	40	108	241.5

Table: 4 Effect of concentration of compost extract on root length in cm.

Extract concentration	root length of Mung seed				root length of Lentil seed				root length of Soya bean			
Time(hours)→	24	48	72	96	24	48	72	96	24	48	72	96
Tap water (without soil)	0.94	2.27	3.6	4.93	0.35	0.614	0.854	1.3	0	0.2	0.466	0.75
Distilled water (without soil)	0.39	1.72	1.77	1.92	0.1	0.51	0.8	1.1	0	0	0.2	0.4
concentration% of compost extract ↓												
5	0.85	2.16	3.47	4.78	0.4	0.84	0.95	1.6	0	0.4	0.82	1.2
10	1.21	2.88	4.55	6.22	0.6	1.1	1.6	1.9	0	0.7	1.12	1.45
15	1.03	2.05	3.07	4.09	0	1.3	1.8	2.0	0	0.7	1.22	1.7
20	1.066	3.077	5.088	7.099	0	1.5	1.9	2.2	0	0.7	1.34	1.95
25	0.93	2.44	3.95	5.46	0	1.6	1.9	2.5	0	1.0	1.5	3.45
30	0.77	2.43	4.09	4.09	0	2.32	2.43	2.87	0	1.0	1.8	3.45

Table: 5 Effect of concentration of compost extract on shoot length in cm.

Extract concentration	shoot length of Mung seed				shoot length of Lentil seed				shoot length of Soya bean			
Time(hours)→	24	48	72	96	24	48	72	96	24	48	72	96
Tap water (without soil)	0	0	3.4	4.7	0	0.53	0.64	0.84	0	0	0	0
Distilled water (without soil)	0	0	1.7	1.7	0	0.31	0.4	0.6	0	0	0	0
concentration% of compost extract ↓												
5	0	0	3.4	4.7	0	0.6	0.83	1.0	0	0	0	0
10	0	0	4.3	5.1	0	1.1	1.4	1.5	0	0	0	0
15	0	0	3.8	4.3	0	1.3	1.5	2.0	0	0	0	0
20	0	0	4.8	6.5	0	1.2	1.4	2.0	0	0	0	0
25	0	0	4.9	5.5	0	1.6	1.9	2.5	0	0	0	0
30	0	0	4.9	4.9	0	2.0	2.3	2.8	0	0	0	0

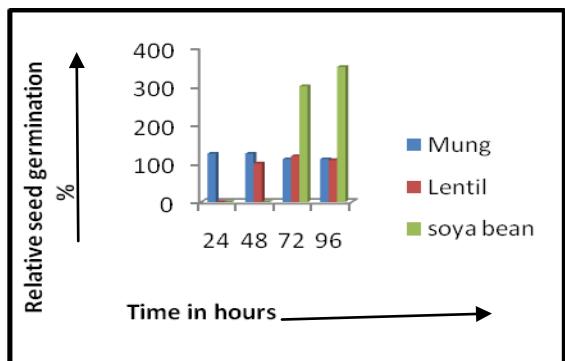


Figure:- (1) Percentage of relative seed germination at 30% of compost soil extract.

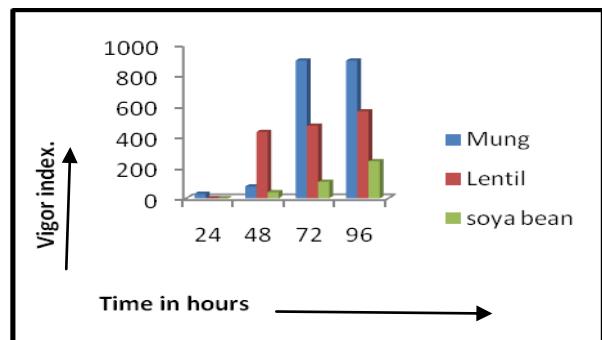


Figure:- (2) Vigor index at 30% of compost soil extract.

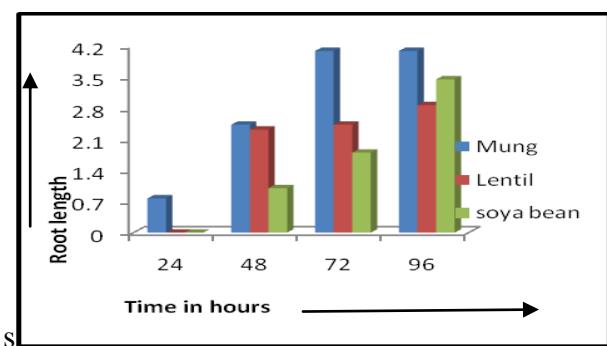


Figure:- (3) Root length at 30% of compost soil extract.

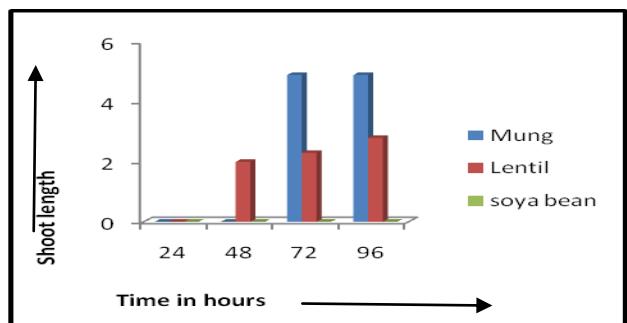


Figure: - (4) Shoot length at 30% of compost soil extract.